IISc COVID-19 Age-Structured SEIR Model

Caveats

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These are trying times, and misinformation goes viral faster than viruses do. We therefore feel compelled to present a short list of caveats regarding COVID-19 models in general and our model in particular.

1 Model and Parameters

We have chosen a simple model of disease spread that makes a number of simplistic assumptions – such as a well-mixed population and ignores many realistic features like spatial dynamics, social network of human interactions and stochasticity. Therefore, the model is to be used for illustrative purposes only.

We have chosen epidemiological parameters based on best published estimates. However, there are many parameters of this disease that are still not known precisely. This is not surprising, as the disease has been discovered only a few months ago.

As a result, there is enormous variability in forecasting the spread of the disease – especially the number of infections and deaths. The absolute numbers do not make sense in the context of these models in the absence of accurate parametrisation.

Simple deterministic models such as the one we present will not prove sufficient in predicting the distribution of probabilities, some good and some grim, that lie in store for us.

2 Initial conditions

When implementing a model like this, the *initial conditions* of the model are key values that indicate what the situation was like when we started the simulation. For instance, if we want to begin simulating on the first of March, how many individuals were exposed to the disease that day? How many were symptomatic? How many were not displaying symptoms? This data can prove extremely difficult to guess, let alone obtain.

We have, in this model, used the *simple heuristic rule that the number of exposed individuals is ten times that of the number of symptomatic individuals*, and the *number of asymptomatic individuals is four times the number of symptomatic individual*. These rules apply only to the starting condition, and not to the dynamics of the model.

However, as you can clearly guess, such rules are mere guesses. The true number of exposed individuals could be hundreds of times that of the symptomatic individuals, or maybe not a very high number at all.

In summary, keep these in mind when you use our model. You can also change the parameters by downloading the codes.

3 Intervention

Perfectly isolating human beings is impossible, and therefore, a perfect lockdown is impossible as well. But guessing how strong a lockdown is is not an easy task. This is because contact between individuals, through which the disease spreads, is linked in a very non-linear way with the actual parameters of disease transmission.

As a result, we provide a *sliding bar* throughout the app that allows you to choose the *strength of the lockdown*, and see its effects on *the flattening of the curve*.

You may make only qualitative inferences from these results, and not quantitative estimates.